
The impact of thinning intensity on forwarder loading

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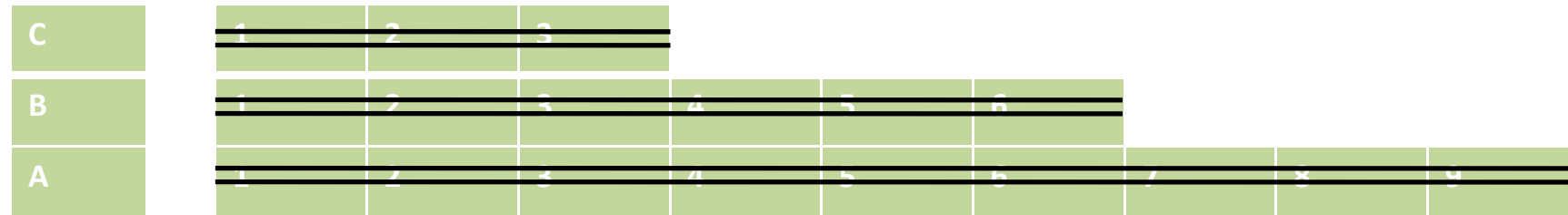


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1. Methods



C	60	P1	55.43		P2	77.73			
B	69	B5	43.53		7	A2	68.79		
A	73	C2	43.69		6	B1	69.18	71.63	85.02
		B6	50.20			A7	71.63		
		B3	50.71			A5	72.96		
		B2	54.67			B4	73.19		
		A6	59.62			A1	73.47		
		C3	63.23			A8	85.02		
		C1	66.46			A3	87.25		
		A4	66.73			A9	98.13		

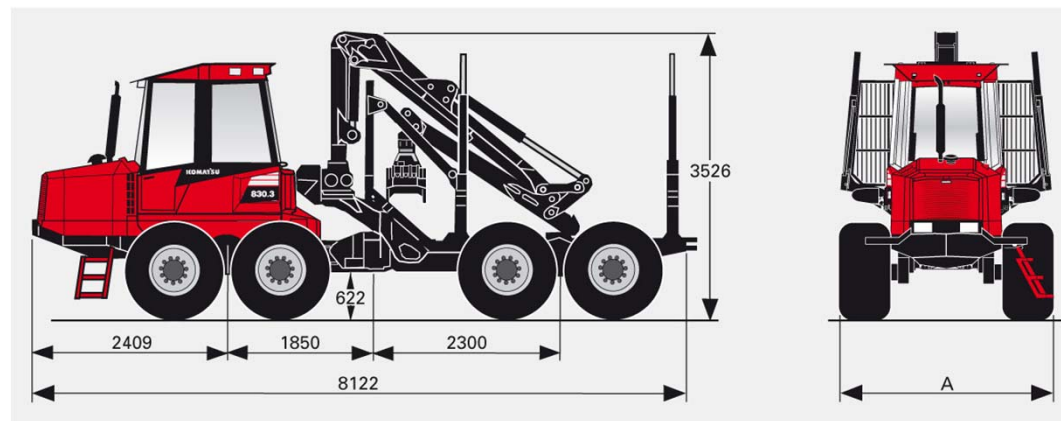
average thinning
intensity growth =
40%

2. Stand characteristics, machine, timber

species composition	age	DBH	H	m ³ ha ⁻¹
pine 100%	55	25	24	341

timber	l (m)	d (cm) u. bark
S2a	2.5	5-12
S2b	2.5	>12

Valmet 860.3	
year	2000
engine power	140kW
weight	12.7t
loading	14t
Cranab 850	10m
grapple	0.36m ²



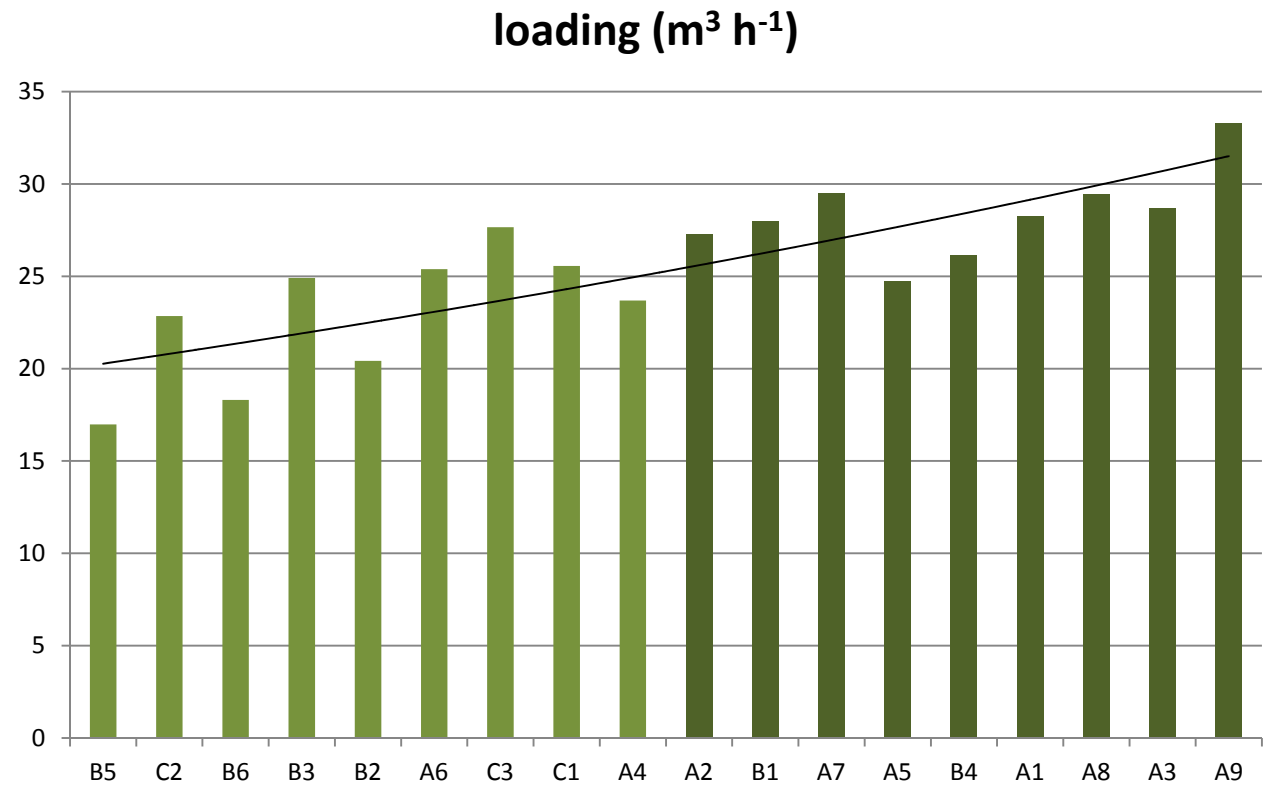
3. Results: loading productivity

Loading productivity:

24% better in P2

P1 = 22.86 m³ h⁻¹

P2 = 28.35 m³ h⁻¹



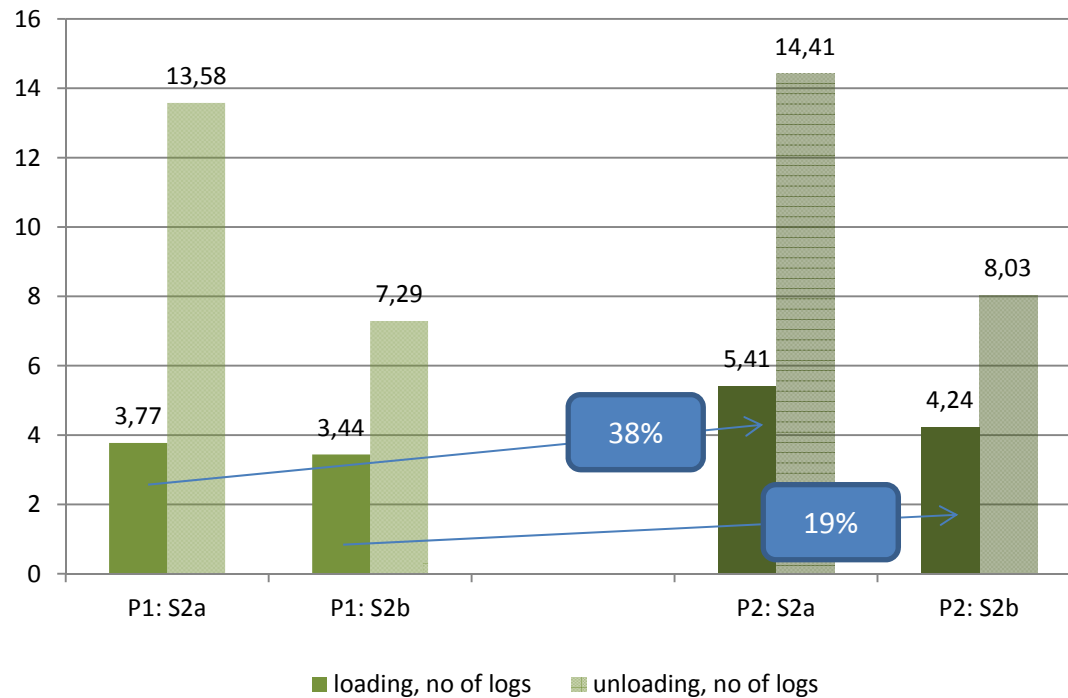
	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>value-p</i>	<i>Test F</i>
between groups	109.7434	1	109.7434	10.03206	0.005974	4.493998
within groups	175.0283	16	10.93927			
total	284.7717	17				

ANOVA

α-0.050

3. Results: grapple use

More logs grappled when loading S2a, in P2 more efficient



ANOVA, $\alpha=0.050$	SS	df	MS	F	Wartość-p	Test F
between groups	12.17245	1	12.17245	41.79597	7.81E-06	4.493998
within groups	4.659761	16	0.291235			
total	16.83221	17				

ANOVA, $\alpha=0.050$	SS	df	MS	F	Wartość-p	Test F
between groups	2,90074	1	2,90074	12,27475	0,002942	4,493998
within groups	3,781083	16	0,236318			
total	6,681823	17				

4. Conclusions

- 1) In the 55-year-old pine stand an average growth of 40% of thinning intensity (from 55.43 to 77.73 m³ ha⁻¹) resulted in 24% better loading productivity (from 22.86 to 28.35 m³ h⁻¹).
- 2) Better use of the grapple was observed in P2 plots: 38% more logs were collected in one grapple when loading S2a (not statistically different) and 19% more logs when loading S2b (statistically different).
- 3) When unloading, more logs of S2a and S2b were grappled: three times more and twice more respectively: optimisation of timber piling by harvester is recommended.

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